

High spectral resolution lidar for aerosol characterization and combined lidar + polarimeter retrieval

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The climate and air quality impacts of tropospheric aerosols depend on characteristics of the aerosol including vertical distribution, particle size, and optical properties of the aerosols. Therefore, knowledge of vertically resolved aerosol properties is important for assessing these impacts as well as model verification. The NASA Langley High Spectral Resolution Lidar (HSRL) instruments make highly accurate, vertically resolved measurements of aerosol extinction, aerosol backscatter coefficient, and aerosol depolarization ratio, and includes significant information relevant to particle shape, size, and composition. Lidar is unique among remote sensing measurement techniques for providing full vertically-resolved profiles of tropospheric aerosols and aerosol properties. However, the relatively small number of wavelengths and angles compared to polarimeter means that the information content with respect to aerosol absorption is relatively low. Advanced retrievals using the HSRL-2 measurements, both alone and with coincident passive polarimeter measurements from the Research Scanning Polarimeter (RSP), provide quantitative indicators of aerosol effective radius, concentration, and absorption properties. Here we discuss the strengths of the HSRL-2 in characterizing aerosol, both alone and in combination with the RSP, with examples from airborne field campaigns including the Observations of Aerosols above Clouds and their Interactions field mission in the Southeast Atlantic.

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